



Space News Roundup

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No. 8



STS-62 crew members, from left Mission Specialist Pierre Thuot, Commander John Casper, Mission Specialists Sam Gernar and Marsha Ivins, and Pilot Andy Allen, spoke to members of the media after arriving at Kennedy Space Center for the STS-62 countdown dress rehearsal earlier this month.

NASA Photo

Stepping stone mission set for Thursday launch

By James Hartsfield

Columbia is poised on Kennedy Space Center's Launch Pad 39B with preparations for a flight the crew calls a stepping stone to the space station entering the home stretch today.

The STS-62 launch, which will begin *Columbia's* sixteenth trip to space, is set for 7:54 a.m. CST Thursday.

The countdown clock is set to begin at 8 a.m. Monday, and the crew—Commander John Casper, Pilot Andy Allen and Mission Specialists Pierre Thuot, Sam Gernar and Marsha Ivins—will leave for KSC on Monday to prepare for the liftoff.

"We've been well-trained by the folks here at JSC and we're all eager to fly," Casper said Wednesday. "We're going to be doing many of the same experiments on this flight that we will be doing on the space station. We'll be flying many more flights just like this one and they're all building toward operating on space station."

Columbia will carry the second United States Microgravity Package in its cargo bay, a set of five experiments ranging from materials

processing in an automated furnace to crystal growth and the behavior of fluids and gases, as well as the Office of Aeronautics and Space Technology-2 experiment package. OAST-2 contains experiments that will study the phenomena of shuttle glow, a glowing effect created on surfaces of the shuttle by the spacecraft's encounters with atomic oxygen at low orbital altitudes, and new technologies that may be used aboard future spacecraft.

Other experiments during the shuttle program's third 14-day-long extended duration orbiter flight will include the Dexterous End Effector, a new type of grapple mechanism and force sensor for the shuttle's mechanical arm that could allow it to perform more sensitive tasks in orbit; and the Limited Duration Candidate Materials Exposure experiment, a study of how materials being developed for future spacecraft withstand the corrosive effects of atomic oxygen in orbit.

Inside the cabin, other experiments will study protein crystal growth, bioprocessing in weightless- Please see **MISSION**, Page 4



Inspections promote on-site safety

By Eileen Hawley

JSC is responding to the challenge of maintaining a work environment as free as possible from workplace hazards by implementing a mock Occupational Safety and Health Administration safety inspection process.

The inspections are part of JSC's efforts to maintain a workplace free of hazards and in compliance OSHA regulations.

As part of this effort, Safety Engi-

neer Kathryn Packard has begun visiting different organizations on site to conduct safety inspections. "The inspections are conducted with the same intensity of an actual OSHA inspection," said Packard, a former OSHA compliance officer and supervisor for three years prior to joining JSC in 1993.

The motivation behind Packard's safety inspections stems from a change in federal policy granting OSHA authorization to conduct tar-

geted safety and health inspections of 14 federal agencies in this region. If the OSHA reform bill passes, NASA and other federal agencies will be subjected to the same fines and penalties that are assessed against private industry.

Any penalties assessed for violations of OSHA safety and health standards will be taken off the top of agency budgets, and those fines must be paid before the money can

Please see **SAFETY**, Page 4

Nominations sought for software award

NASA's Office of Safety and Mission Assurance in conjunction with the Inventions and Contributions Board has created the Software of the Year Award to give recognition to software or software technology used by the agency.

"Software and software technology are essential to the success of NASA missions," said Fred Gregory, associate administrator for OSMA. "This award is equal in stature to the Inventor of the Year Award."

The award, which will include a plaque and a monetary award of up to \$100,000 will be presented to author(s) of software programs or technologies promoted, adopted, sponsored and deemed significant in the performance of NASA's space

and aeronautics activities.

Entries will be judged by a panel comprised of software development experts. Following that review, the panel will submit its selection(s) to the ICB.

The panel may recommend a single monetary award of up to \$100,000 for a major contribution, several lesser awards, or no award when, in its opinion, no major or significant contribution can be clearly identified.

Software programs are defined as packaged products submitted to the Computer Software Management and Information Center at the University of Georgia. If submission is a software program, it must be in the COSMIC inventory, in the pro-

cess of submission to COSMIC, or legally disseminated via patent or copyright through a contractor with royalties to NASA.

Software technologies are defined as non-patentable concepts, processes or development aids that may be utilized in the production or maintenance of high quality software products. If the submission is a software technology, adequate documentation must be provided to, or be in the process of submission to the National Technical Information Service to ensure availability.

For additional information on award criteria, contact the Awards Liaison Officer. Entries and supporting material must be submitted no later than June 1.

Recycling can help the environment

By Kelly Humphries

JSC employees will be able to start crushing cans and flattening boxes on-site starting March 1, when JSC's Center Operations Directorate kicks off two new recycling programs.

The first is an aluminum can recycling service that will allow employees to help save the Earth's energy resources, said Trudy Papler, the project coordinator for COD's Environmental Services Branch. Aluminum recycling uses 94 percent less energy than virgin production, and aluminum can be recycled indefinitely, she explained.

The program also will help fund Employee Activities Association events.

Collection sites will be set up in

Bldgs. 1, 4, 16, 30, 45 and at the Gilruth Center to start. JSC will evaluate the usage during a four-month trial period and consider expanding it to other buildings if it is successful.

"The government needs to set an example for industry and people in general that recycling is a good thing and needs to be done," Papler said. "It's not so much how much money we are going to make on this program, but that we set a precedent for people to follow."

The second, a cardboard recycling program, won't involve as much direct employee participation but it will help save trees and energy.

In that program, DMS workers will deliver any cardboard that can be recycled to a compactor near

Bldg. 300, and Best Waste will haul the material to a recycler. The cardboard recycler will pay Best Waste, which will credit the DMS account and JSC. The money will be used to recoup the costs of compacting and transporting the cardboard to the recycling site. In addition, the program is expected to reduce "tipping fees" charged by Best Waste for every dumpster of trash it hauls away. Since cardboard makes up about one-third of JSC's solid waste, the savings should be substantial.

Employees who have a lot of things sent to them in cardboard boxes and want to get rid of them, should call Jo Kines at x33218. For more information about can recycling, call Papler at x33117.



JSC Photo by Bob Walck

Sandy Parker and Trudy Papler demonstrate that recycling can be fun.

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Store from 10 a.m.-2 p.m. Monday-Thursday and 9 a.m.-3 p.m. Friday. For more information, call x35350 or x30990.

Moody Gardens — Discount tickets for two of three different attractions: \$9 Entertainment '94 Coupon Books — Bay Area/Galveston/Downtown or FM 1960/Downtown: \$30 each, \$1 off first book for civil servants. Gold C Books: \$8 Space Center Houston — Discount tickets: adult, \$7.50; child (3-11), \$4.50; commemorative, \$9.95. Metro tickets — Passes, books and single tickets available. Movie discounts — General Cinema, \$4.50; AMC Theater, \$3.75; Loew's Theater, \$4. Stamps: Book of 20, \$5.80.

JSC

Gilruth Center News

Sign up policy — All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a NASA badge or yellow EAA dependent badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of registration. No registration will be taken by telephone. For more information, call x30304.

EAA badges — Dependents and spouses may apply for photo identification badges from 6:30-9 p.m. Monday-Friday; 9-11 a.m., 1-3 p.m. and 6:30-9 p.m. Wednesdays; and 8 a.m.-4 p.m. Saturdays. Dependents must be between 16 and 23 years old.

Weight safety — Required course for employees wishing to use the weight room is offered from 8-9:30 p.m. March 10. Pre-registration is required. Cost is \$5.

Defensive driving — Course is offered from 8:15 a.m.-3 p.m. Saturday. Next class is March 5. Cost is \$19.

Self-defense workshop — Free self-defense workshop is offered from 5-6 p.m. March 9.

Aerobics — High/low-impact class meets from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32 for eight weeks.

Exercise — Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is \$24 for eight weeks.

Aikido — Martial arts class meets from 5-7:30 p.m. Tuesdays and 6:15-8:15 p.m. Wednesdays. Black Belt class from 6-8 p.m. Fridays, requires instructor permission. Cost is \$25 per month.

Spring softball — Sign up for Mixed C recreational league March 1. Men's C registration is March 2; Men's B and Mixed B on March 3; and Men's A and Men's Over 40 on March 4. Non-badged teams for all leagues will be able to sign up only after 4:30 p.m. March 4.

Softball tournament — Men's Open C pre-season softball tournament will be held March 26-27. Registration deadline is 7 p.m. March 24. Cost is \$100.

Stamp club — JSC Stamp Club will meet from 7-9 p.m. every other Monday. For more information, call Dianne Kerkhove at 554-2764

Fitness program — Health Related Fitness Program includes a medical examination screening and a 12-week individually prescribed exercise program. For more information, call Larry Wier at x30301.

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Dates & Data

Today

Cafeteria menu — Special: baked meatloaf. Total Health: lite macaroni and cheese. Entrees: baked scrod with Hollandaise, broiled chicken, pork and beef egg rolls, steamed fish, Reuben sandwich. Soup: seafood gumbo. Vegetables: stewed tomatoes, seasoned spinach, cut corn, macaroni and cheese.

Saturday

LPI lectures — Dr. Chris Chyba will speak on "Comets and the Origins of Life" at 7 p.m. Feb. 26 at the University of Houston Clear Lake's Bayou Theater. The lecture is sponsored by the Lunar Planetary Institute.

Monday

Cafeteria menu — Special: Italian outlet. Total Health: roast beef au jus. Entrees: chicken a la king, enchiladas with chili, baked lasagna with meat, steamed fish, French dip sandwich. Soup: split pea and ham. Vegetables: Brussels sprouts, oriental vegetables, buttered carrots, lima beans.

Tuesday

Cafeteria menu — Special: stuffed cabbage rolls. Total Health: roasted turkey. Entrees: turkey and dressing, country style steak and hash browns, beef ravioli, baked chicken, French dip sandwich. Soup: tomato Florentine. Vegetables: Italian blend, okra and tomatoes, corn coblette, navy beans.

Wednesday

Astronomy seminar — The JSC Astronomy Seminar will meet at

noon March 2 in Bldg. 31, Rm. 129. For more information, call Al Jackson, 333-7679.

Cafeteria menu — Special: pepper steak. Total Health: stir fry pork with rice. Entrees: liver and onions, catfish and hush puppies, stir-fry pork with rice, steamed fish, Reuben sandwich. Vegetables: steamed broccoli, yellow squash, macaroni and cheese, vegetable sticks.

Thursday

Insurance benefits — Representatives from the Government Employees Hospital Association will be available from 8:30 a.m.-3:30 p.m. in Bldg. 45, Rm. 251 to discuss GEHA benefits and insurance claims. For additional information, contact Employee Services at x32681.

Russian speakers — Practice Russian language skills from 11 a.m.-1 p.m. March 3 in the Bldg. 3 cafeteria. For more information, call Jack Bacon, x38725, or Amy Mendez, x38066.

Cafeteria menu — Special: chicken fried steak. Total Health: fat-free vegetable soup. Entrees: beef tacos, scrod with Hollandaise sauce, steamed fish, French dip sandwich. Soup: navy bean. Vegetables: spinach, cut corn, breaded okra, pinto beans.

Friday

Cafeteria menu — Special: tuna noodle casserole. Total Health: steamed salmon steak. Entrees: steamed salmon steak, roast beef, baked chicken, steamed fish, Reuben sandwich. Soup: seafood gumbo. Vegetables: French cut green beans, cauliflower with

cheese, green peas, black-eyed peas.

March 9

Astronomy seminar — The JSC Astronomy Seminar will meet at noon March 9 in Bldg. 31, Rm. 129. For more information, call Al Jackson, 333-7679.

PSI meets — The Clear Lake/NASA Area chapter of Professional Secretaries International meets at 5:30 p.m. March 9 at the Holiday Inn on NASA Road 1. Marita Irmiter, an attorney, will discuss "Durable Power of Attorney and Living Wills." For additional information, contact Elaine Kemp, x30556 or Diana Peterson, x30390.

March 10

Russian speakers — Practice Russian language skills from 11 a.m.-1 p.m. March 10 in the Bldg. 3 cafeteria. For more information, call Jack Bacon, x38725, or Amy Mendez, x38066.

March 12

LPI lectures — Dr. Eugene Shoemaker will discuss "Cosmic Bullets, Craters and Catastrophes" at 7 p.m. presented by the Lunar Planetary Institute at the University of Houston Clear Lake's Bayou Theater March 12.

March 16

Astronomy seminar — The JSC Astronomy Seminar will meet at noon March 16 in Bldg. 31, Rm. 129. Jim Oberg will speak on "Buying Moon Rocks and other Space Auction Stories." For more information, call Al Jackson, 333-7679.

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Ads may be run only once. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2. No phone or fax ads accepted.

Property

Sale: Meadowgreen 3-2-2, 1909 sq ft, \$112.5k. x39018 or 480-7610.

Lease: CLC/Ellington, 2 BR condo, vault ceilings w/fans, new paint, carpet, pool, W/D hookups, clean, \$450/mo + dep. 326-1761.

Sale: Luxurious condo, Ft. Lauderdale, FL, timeshare, 300 ft from Atlantic, incl worldwide accom, yacht/tennis club. \$12.5k. x36851.

Lease or Sale: Friendswood 3-2-3, both formals, 3+ car garage, new hi-eff A/C and appli, \$750/mo or \$65K. Gary, x31059 or 480-9716.

Sale: Lake Livingston, Point Blank, TX, 3-2, lg wooded lot. John, 235-2342.

Sale: April Sound timeshare Memorial Day wk, plus 1 unsched wk/yr, car swap wks w/other locations, worldwide. John, 235-2342.

Sale: Eldorado Trace, clean studio condo, end unit facing pool, W/D, all appli, FPL, sec alarm, 900 sq ft, \$32.5k. Bill, x35615 or 946-7152.

Rent: Winter Park, CO ski condo, fully furnished, 2-2, sleeps 6. 488-4453.

Rent: Galveston beach house, furnished, A/C, day/wk. Ed Shumilak, x37686 or 326-4795.

Sale: Galveston beach house, 3-2, CA/H, furnished, new carpet, 300 ft from beach. Ed Shumilak, x37686 or 326-4795.

Rent: Arkansas cottage, Blue Mountain Lake, furnished, wooded, 4 ac, screened porch, \$250/wk, \$50/day. x33005 or 334-7531.

Rent: Galveston condo, furnished, sleeps 6, Seawall Blvd and 61st St, wknd/wkly/dly rates. Magdi Yassa, 333-4760 or 486-0788.

Sale: Nassau Bay, 4-2-2, \$115.5k. 333-3876.

Sale: Sagemont, 3-2-2, new roof and carpet, lg den, both formals. Ben, x34339 or 481-1439.

Rent: Ski Wolf Creek, Southern CO, furn, 2 BR house, sleeps 6, no smoking/pets, day/wk /mo or longer. Bob, x30825 or 998-7372.

Cars & Trucks

'75 Chevrolet PU, step-side, 350 V8, 3 spd, PS, PB, \$650 OBO. Mike, 334-2685.

'84 Toyota Supra, 91k mi, pwr sunroof, needs minor work, tires, \$3700. x30993.

'91 Geo Metro, 4 dr, 5 spd, red, 21.5k mi, A/C, AM/FM, ex cond, \$5.3k. Bob, 282-4510 or 482-5984.

'91 GMC Sonoma w/camper shell, ex cond, PS, PB, A/C, tilt, cruise. x38278 or 334-7258.

'86 Nissan Sentra, low mi, 5 spd, AM/FM/cass, tinted windows, good cond, \$2.4k. 332-2796.

'87 Nissan Maxima SE, sun/moon roof, PW, PDL, AM/FM/cass, auto, good cond, make offer. 332-2796.

'87 Merkur XR4Ti 2.3 Turbo 5 spd, burgandy w/leather int, pwr windows, sunroof, ex cond, \$6.2k OBO. x34599 or 559-2716.

'82 Dodge stakebed, new tires, trans, battery, sideboards, DOT inspected. 485-7274 or vmail 639-3138.

'92 Nissan 240SX coupe, 5 spd, maroon, 16k mi, \$10.5k. 996-7602.

'91 Chevy Silverado PU ext cab, 3" lift kit oversize tires, V8, loaded, brilliant blue, \$12k. Phil, 212-1339 or 377-6614.

Ford 360 truck engine, needs rebuild, free, must pick up. Tim, 333-6937.

'72 VW Super Beetle, rebuilt eng, new paint, starter and generator, needs new reverse, \$1.2k. 488-9044.

'88 Chevy Suburban, Silverado pkg, low mi, ex cond, tow pkg, clean, \$9950. 482-7546.

'82 Camaro, A/C, auto, 2.8L V6, AM/FM/cass, brown/beige, clean, ex cond, low mi, \$2.5k OBO. 991-5280.

'82 Chevy 3/4 ton, std, 71k mi, strong towing truck, utility bed, \$1850. 339-1176.

'86 Audi 5000CS, loaded, leather int, ex cond, sun roof, auto, 63k mi, \$5.4k. 485-2987.

'51 Chevy PU, orig eng and trans, runs/drives well, new slate metallic paint, new wood bed w/walnut stain; '77 Chevy El Camino, body fair, 350T/350, \$3.5k for '51 or '4.3k both. James, x31204 or 944-2590.

'87 Ford Tempo, blk, 65k mi, 5 spd, \$1.9k. x45509 or 337-4712.

'85 Mazda RX7-GL, red sports car, repainted, looks new, good working condition, 101k mi. x36284 or 532-2051.

'78 Porsche 928, brown w/leather int, auto, ex cond, 75k mi. \$8.5k. Bill, x48889.

'81 BMW 320i, sun roof, 164k mi, \$2k. Steve, x35414 or 332-6214.

'90 Isuzu Trooper, LS pkg, red, 2.8L V6, 4 dr, 4wd, 5 spd, 47k mi. 333-6962.

Boats & Planes

13' Coleman Ram-X canoe, almost new, \$225. x38278 or 334-7258.

12' windsurfer, 6m sail, Porsche design, ready to sail, \$250. Hugo, 335-2552 or 286-0432.

U.S. Yachts 22' sloop w/4.5hp O/B motor, 2 sails, galley, sleeps 5, ex cond, \$5k. Russ, x45979 or 332-1769.

'75 22' Venture 222, orig owner, ex cond, galv trlr, 6hp O/B, pop-top, swing keel, \$2.5k neg, see at Canyon Lake, P. D. Smith, 946-1895.

Islander 36', diesel, refig, roller furling jib, auto-pilot, hot water, LPG stove, recently hauled, totally refurbished cabin. James, 334-5120.

Chrysler 22' sailboat, sleeps 6, galley, head, fixed keel, 5 hp O/B, mainsail, 2 jibs, ex cond, slip in Clear Lake, \$2.8k. 282-1727.

Cycles

'86 Honda Goldwing Aspencade SEI, matching trlr, Aspencade helmets, garaged, \$5495. 482-5837.

Trade Team Fuji racing bike, 12 spd Suntour equip, ex cond, for comparable mountain bike. James, 282-3215 or 480-9448.

Yamaha RZ350, Kenny Roberts replica, pro eng porting, Mikuni carb, pipes, K&N jet kit, Dunlop radials, bike cover, helmet, \$1895 OBO. Hugo, 335-2552 or 286-0432.

'85 Honda VF750F motorcycle, European issue, good cond, \$1.8k. x45509 or 337-3222.

Trade Honda XL 500 in sound mech cond for 250cc to 350cc dirt bike in same cond. 482-3428.

'84 Honda Shadow, 500cc, 14k mi, new tires, brakes and exhaust sys, \$1.2k OBO. Ken, x31647 or 332-0882.

Audiovisual & Computers

AM/FM stereo receiver, 25 Wpc w/bass reflex speakers, \$75. x36851.

NEC-286 computer, 640k RAM, 44MB HD, 3.5 FD, 5.25 FD, color monitor, kybd, S/W, \$600; Panasonic KXP-1180 printer, \$60. Earl Rubenstein, 480-1998.

Stereo components: pr Ultralinear speakers, \$20; JVC cass, stereo recorder, \$25; Hitachi turntable, \$40, Technics single CD player, needs repair, \$10. Jim, x39229 or 482-7873.

Car CD sys: Yamaha CD player/tuner, Sherwood 240W amp, two 12" subwoofers, was \$900, now \$450. Hugo, 335-2552 or 286-0432.

386-16MHz mother board, \$35; 40MB HD, \$80; eight 256 RAM SIPP chips, \$50 for all; serial/parallel card, \$15; serial card, \$5. 339-1176.

Car stereo: Fosgate 5.25" punch midrange, 4 ohm, \$50; JBL 4x6 plates, titanium tweeter; \$50; Sony 5.25" 2-way speakers, \$35; JVC 4" dual cone speakers, \$10; Fosgate series I 8" woofer, \$20; Kenwood 3.5" speakers, \$15; Sony cass pull-out, \$50. Brian, 996-8567.

Nintendo games and equipment for sale. Nolan, 489-7494.

Two full-sz 2" Quad VTRs, RCA model TR-72, working when taken out of service from a Waco TV station, high band color and A/B roll editor, includes space scanner assemblies, all manuals, test tapes, best offer. x31131.

ACER 386SX-16MHz w/80387 math coprocessor, 5 MB RAM, 14" color monitor, Super VGA card, 640 x 480 at 256 colors, 40MB HD, 2400 baud Hayes compatible modem, mouse, kybd, S/W, \$500. Mitch, 333-6949.

Photographic Pentax Spotmatic 35mm SLR camera system w/preset lenses, 50mm f1.4, 135mm f2.3, 35mm f3.5, macro 2:1, 50mm f4.0, 2X extender, filters, cases, manuals and leather gadget bag, ex cond, \$225 OBO. John, x36195 or 335-1092.

Musical Instruments Yamaha YFL 385 H flute, stand and case, was \$870, now \$600 OBO. Sal, x37764 or 438-2740.

Pets & Livestock Emu chicks and breeders. 482-0874. AKC reg Boston Terriers, b Feb 2, '94, 4 male, 3 female. 489-4558 or vmail 639-3138. AKC Lab pups, yellow and blk. Rob, x41027 or 538-1449. AKC reg Siberian Husky, female, 1.5 yrs old, blk/wht, blue eyes, medical records, \$150 OBO. 991-5280. Boxer mix puppy, free. Laurie, x35590 or 991-0821.

Household 3 pc sectional couch, earth tones, \$125; breakfast rm table, white formica top w/wood trim, \$75. Mike, 334-2685.

Rattan couch, chair, coffee table, 2 end tables, lamp table, desk, chair; blond rattan dining room table w/4chairs; wicker papasan chair and table; \$500 OBO, or trade for dark wood dining table. Steve, x37152 or 992-7049.

Dinette, glass top w/brass legs, 44" x 48", 4 chairs w/beige fabric on seats, ex cond, \$200. Tony, x35966.

Philco 19" color TV, 10 yrs old, good cond,

\$50. Debbie, x47130 or 286-2947.

On sz motionless waterbed w/6 drawers, mirror headboard, extras, neg. 929-7194 or 409-925-3205.

Oak entertainment center, holds lg TV, rack stereo, VCR, storage. \$175. x47812.

Kg sz waterbed, platform w/6 drawers and 2 cabinets, lighted, mirrored headboard, w/stained glass cabinets, \$100 OBO. x37349 or 480-8269.

White ceiling fan w/light, unopened, \$20; dinette legs w/6 chairs, top broken, \$35; blue sectional w/2 reclining ends, well used, \$65; 3-drawer file cabinet for pamphlets, \$15. 339-1320.

Dining chairs, chrome and grey upholstery, \$200 for 4; butcher block cart w/wheels, towel rack, hooks, knife storage, \$50; bed in a bag, full sz comforter, dust ruffle, 2 sets sheets, grey stripe, \$30; kg sz dual control electric blanket, \$20. Linda, 488-8588.

Wanted Want to trade rodeo tickets, 2 Alan Jackson, 4 pm Feb 20 for 3 any country show, tickets are 400 level, trade for equal or better. Herman, x35095 or 409-389-2461.

Want roommate, nonsmoker, to live in my Friendswood 4-2 home, W/D, cable, VCR, microwave, gas grill, all household privileges, \$250/mo, all bills paid. Michael, x38169 or 482-8496.

Want bunkbeds w/mattress that can be separated, also 4 or 3 drawer dresser. x37796.

Want female roommate to share 3 BR house in the Landing, LC, \$300/mo + 1/2 util. Cathy, x41267 or 554-4579.

Want vanpool riders for West Loop Park and Ride to NASA. Richard, x37557.

Miscellaneous Lawnmower, 22" out, runs fine, self propelled, \$50; brown traverse rod, about 2" to 3" dia, expands to over 200" long, unused, \$10. Dennis, x39012 or 992-5285.

Commercial freezer, was \$1.2k, now \$999; '83 9.9 hp Johnson O/B, \$800. x32075.

Hubble Space Telescope mural by Robert McCall, glass framed, ex cond, \$200 OBO. Steve, 339-1136.

Cherokee camper shell for full sz, long bed PU, tan, \$150 OBO. Tom, x30805 or 944-7602.

Crib 'N' Bed baby crib, 5 drawers, crib converts to bed, wood finish, \$250. x34599 or 559-2716.

Canon Typestar 110 electric typewriter w/erase feature, menu and line viewer, \$125; Olivetti manual typewriter, \$65. 486-7111.

Pioneer HPM-100 4-way speakers, 100 Watt capable, \$150 pair; Cobra tele answer, \$20; Kenmore 15 cu ft refrigerator, \$25; brown leather-like expandable brief case, unused, \$20. Steve, x37152 or 992-7049.

Over 50 plate collectables, various artists and series, \$15 ea or 2 for \$25, inventory list avail. Earl Rubenstein, 480-1998.

Mismatched dishes, glass ware, flat ware, best offer. 559-1437.

Desk w/credenza, 3 drawer file, white melamine, 60" x 35", \$225. x39588 or 487-1883.

Mondo roller blades, men's sz 10, ex cond, \$50; 2 infant car seats, \$25 ea. Steve, x49625.

Solid brass port hole, good cond. x40250 or 409-925-7839.

Brother sewing table top style machine w/ free arm swing, simple zigzag stitching, satin stitching for buttonholes or decorative, \$80 OBO. Sal, x37764 or 438-2740.

Lg play pen, \$25; sm play pen, \$15; car seat, \$20 ea, strollers, \$15 ea, wood rocking horse, \$20; mounted 8 point deer head, best offer. Sam, 332-2168.

Simmons crib w/mattress, \$200; Fisher Price full sz play pen, \$50; Century STE2000 carseat, \$35; Autocad release 12 and its application text book. x36776 or 286-3266.

Sofa, loveseat, chair and ottoman, blue/gray, nonsmoker, \$300; Tunturi rowing machine, \$75; metal extension ladder. x38516 or 482-8820.

Camper shell, red and white, fits Toyota 4x4, \$200; California carpet kit, \$150 or both for \$300. 488-9044.

Black vinyl coated wire screen, 1" x 1", 4' wide for use on bird or pet cages. Parker, x35178 or 922-6628.

Suddenly, Tomorrow Came...

Chapter 14: Aspects of Shuttle Development

[Editor's note: This is the last of four excerpts from the official history of the Johnson Space Center, the newest addition to the NASA History Series. The book, produced in-house at JSC, will be available in March.]

By Henry C. Dethloff

Although the Shuttle flights, beginning with the four orbital test flights in 1981 and 1982, took Americans back into space after an absence of 6 years, the ground rules or "Earth rules" for spaceflight had changed. The Shuttle had a different commitment and different purposes than previous programs. The Shuttle was exclusively an Earth-to-orbit transportation system. Defense and earth sciences loomed proportionately larger in its development and operation. Costs remained critical. Benefits were of the essence. "Payloads" became a Shuttle euphemism for payoff. Popular enthusiasm for space waned. National prestige was no longer so threatened as it had been before Apollo. Americans in the Shuttle era no longer mobilized for space as though preparing for a hopefully short and determinate war. They began to learn to accept space, with its technology, its benefits and its costs, as a part of everyday life.

The enthusiasm, the commitment, and the funding for space ventures declined perceptibly after Apollo. Apollo had the national spotlight. It was a prestigious program, was popular, and seemed to have unlimited backing. Money was always available for necessary work. The Shuttle was conceived under that same aura, but developed and flown under different circumstances. When the Shuttle began, it was to be one element of a grand design which included a space station, unmanned planetary missions, and a manned flight to Mars. The Johnson Space Center was to become a multiprogram center. But the Shuttle ended up being the only program.

The designation of JSC as lead center, effectively transferred Level II or technical control of Shuttle development from Headquarters to JSC. During Apollo, although Headquarters nominally exercised technical control, technical management was actually dispersed among the spaceflight centers which operated under very strong leadership. Thus, the designation of one center as lead center put technical control where NASA had in-depth technical support. Headquarters exercised less technical management on the Shuttle than it had on Apollo, in part because of its relatively smaller technical staff. The lead center management style made most efficient use of NASA's personnel and resources.

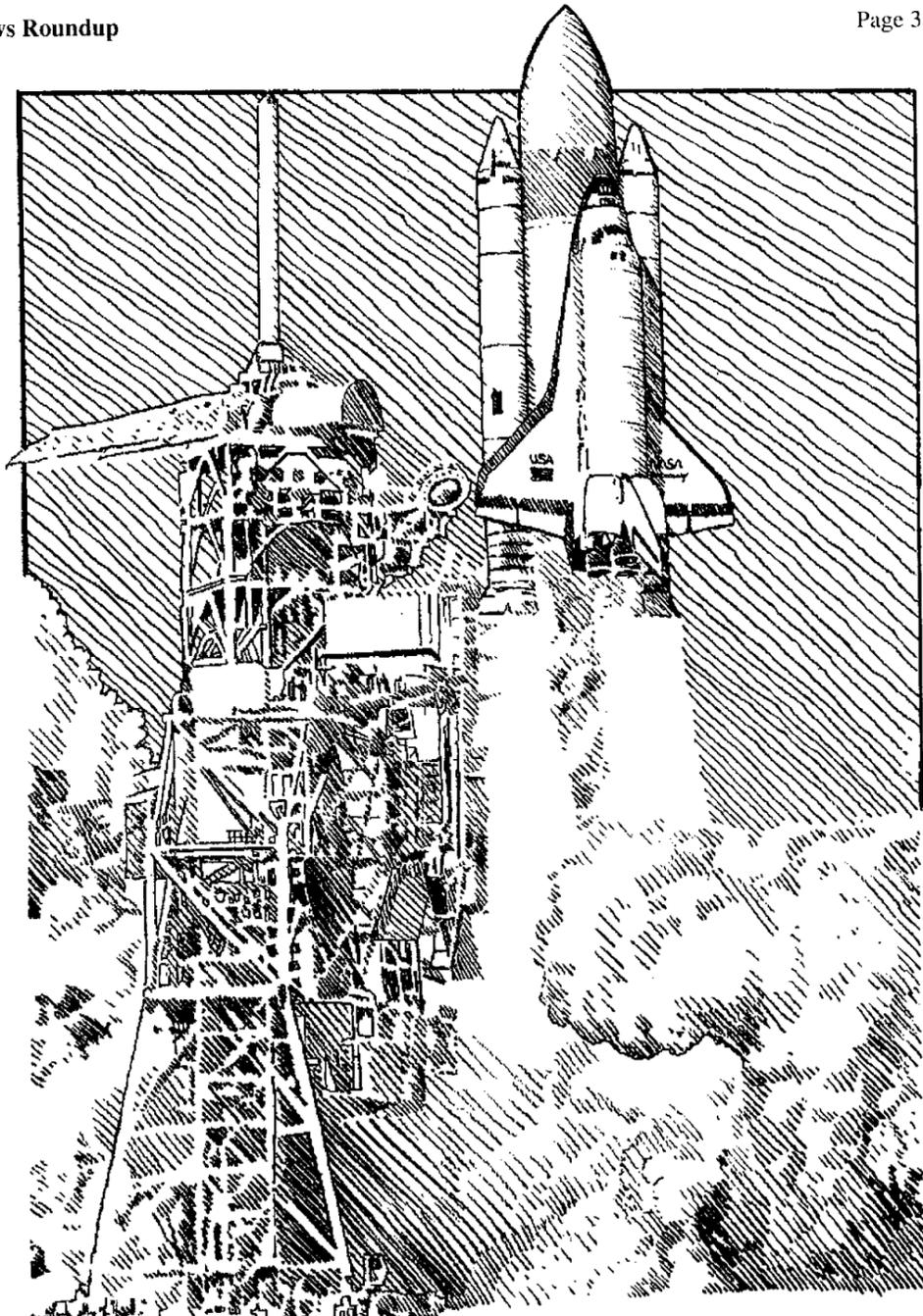
Owen Morris, previously identified as a cofounder of Eagle Engineering after he retired from NASA as head of the Systems Engineering and Integration Division in the Shuttle Program Office, had primary responsibility for integrating the orbiter in the overall Shuttle system. He believed that under lead center management the work and coordination among the centers went quite well. The Shuttle represented a challenge to systems engineering. It was a much more complex machine. There had been a progressive increase in the complexity in the interfaces involved in each program from Mercury through the Shuttle. The Apollo manned capsule interface with the propulsion system was accomplished with 96 bolts and 93 wires. The Shuttle was an integrated vehicle and much more complex. There were 3200 separate wires leading from the

propulsion system of the Shuttle. The forthcoming space station has yet a "much, much more complex interface." Despite budget and personnel cuts, the Shuttle was a relatively well designed and managed program. The budget cuts were most damaging in that NASA could never plan for lean years and good years. Cuts were always followed with promises of better funding ahead; thus NASA always tried to rebuild and gear up for another productive surge, only to have the funds cut at the last minute—often by OMB rather than by Congress. OMB, which functioned under the authority of the Executive Office, tended to be less supportive of NASA programs than did Congress. But the real problem with lean years was that invariably research funding suffered first, and as development and construction began, budget constraints often translated into reducing spare parts or redundant systems. Rodney G. Rose, who headed a special flight operations planning group for Apollo, believed that budget constraints meant that the Shuttle became operational with far fewer spares than the Air Force, for example, considered adequate.

Moreover, inasmuch as the program office made research allocations, research funding tended to be directed to specific purposes and lacked the broad base and diversity needed. In addition, when basic research and developmental work was delayed or slipped to meet a launch deadline, it meant that down the line some of the essential "dirty-handed" engineering would not be available when needed. The costs of Shuttle development were exacerbated by the delays. The technical losses (largely in the area of basic research and development) were long-term rather than immediate.

One unique element in Shuttle development had to do with mission operations planning, which had evolved to a considerably higher level of sophistication compared to that of the Apollo and earlier programs. Mercury had begun with a fairly simplistic aircraft flight operations approach. The process matured during Gemini operations when a systems handbook and direct interface between flight control teams and the crew provided real-time ground-to-space interaction. Gemini EVA heightened the relationship between the astronaut, the task, and the working environment. During Apollo, the operations team "worked in an integrated fashion on all issues involving flight systems, flight design, science, and manned operations."

Shuttle flights, however, had greater and more diversified capabilities and more participants in terms of federal agencies, institutions, and even foreign nations. Skylab flight operations were much more of a learning experience for Shuttle flight operations than had been Apollo. During Skylab, systems engineering and integration processes began to be applied to flight operations in a formal context. Skylab, as the Shuttle would have, had a complex flight program involving the designer and builder of the craft, the science experiment user, the crew, and mission control. Critical engineering support for Skylab flights was derived through the creation of a joint JSC/Marshall Space Flight Center review team which screened the



systems engineering and integration processes as they related to the flight plan. In other words, it tested prior to flight the compatibility of the men and the machine and anticipated the ability of both to accomplish the mission. This was done through formal systems operations compatibility and assessment reviews.

Whereas one might remember that the Mercury capsule was built almost oblivious to the fact that it would carry a person (almost by accident did an astronaut discover that the original design had no visor plate), Shuttle design and construction involved close support from the mission operations team. The Shuttle was built with the understanding that

good flight operations required something of a symbiotic relationship between the human occupants and the machine—and that this relationship must extend to its ground support systems. For flight operations, systems engineering and integration is a process by which "the technical, operational, economic and political aspects of programs are integrated to support the program objectives and requirements consistent with sound engineering, design and operations management principles."

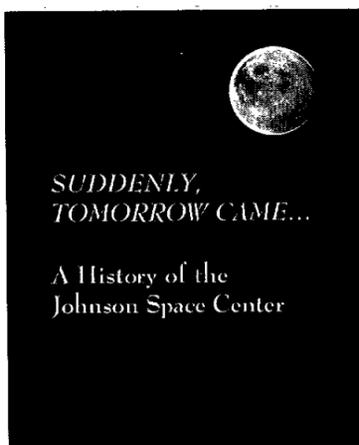
Shuttle flight, STS-5 (*Columbia*) crewmember Joseph P. Allen observed, is technologically complex, cooperatively challenging, and personally exhilarating. Each launch is unique and one of the "richest events" of a lifetime. It was a sentiment generally shared by NASA personnel at each of the centers, and especially by the mission control personnel linked to the Shuttle through the invisible threads of radio, electronics, and human spirit. It was at the Mission Control Center during Shuttle flight that the rich mixture of crew, machinery, engineering, scientific and support structures melded.

Fewer operators worked the Mission Control Center at JSC than in the days of the Apollo lunar missions, but Shuttle flight operations required a networking of the support team composed of the flight control room, the multipurpose support rooms with the payload operations control centers located at JSC or elsewhere. A payload operations control center at Goddard Space Flight Center, for example, monitored all free-flying (satellite) systems delivered, retrieved or serviced by the Shuttle, including the two communications satellites delivered into orbit by *Columbia* on the STS-5 mission. Both

satellites were built by Hughes Aircraft Company under contract—one for a private company, Satellite Business Systems, and the other for Telesat of Canada. Hughes engineers, as well as technicians representing the contractors, monitored the satellite launches from remote payload operating control centers. In the event the Shuttle was delivering satellites for interplanetary exploration, as would be true in later flights, a payload operating control center at the Jet Propulsion Laboratory in Pasadena, California, managed the payload.

Beneath the primary flight control rooms at JSC (on the second floor of the Mission Control Center or for DoD missions on the third floor), the network interface processor provided an intermittent flow of real-time information coming from the Shuttle and other operating centers and fed it to flight control. Also on the first level, the data computation complex compared tracking and telemetry data with Shuttle flight progress. Although the facade and apparatus of the Mission Control Center had changed little since the days of the Apollo lunar flights, flight control systems were enhanced substantially due to the advances in electronics and computer technology—advances which were in part derived from previous NASA spaceflight experiences.

Shuttle flight control became much more streamlined than during Apollo flights, and depended on advanced information systems and computer programs (although the external hardware in the Mission Control Center was much the same). The Shuttle required all new computer software—adjusted and reconfigured for each Shuttle mission. Development and ownership of software was a big challenge in the design of Shuttle operations. Improved information systems, derived from more sophisticated computer hardware and sophisticated programming, at least in part, facilitated the reduction in the numbers of flight control personnel. Better systems engineering and integration also helped. Mission Control teams for the Shuttle were pared to one-half the size of Apollo teams with 80 people on each flight control team and 3 teams for each mission. The 22 controllers stationed in the flight control room of the Mission Control Center managed a host of technical advisors in multipurpose support rooms in the Control Center and had access to support groups stationed throughout the United States—and indeed in other countries. As mentioned earlier, Wayne Hale, a Shuttle flight director, likened the operation of the Shuttle to the operation of a battleship, except that instead of thousands of crewpersons aboard the ship, there were only six or seven on the orbiter and the other thousands were stationed on Earth. □



SUDDENLY,
TOMORROW CAME...

A History of the
Johnson Space Center

Joint NASA-industry efforts aim to reduce exhaust emissions

Experiments conducted jointly by NASA and industry to reduce exhaust emissions to environmentally compatible levels for future supersonic airlines have produced results greatly exceeding the program goals.

The tests, which used an engine fuel combustion chamber sector, representing about one-fifth of a full-scale design, beat the agency's goal of generating no more than 5 grams of oxides of nitrogen per kilogram of fuel burned at super-

sonic flight speed.

Scientific studies suggest that a fleet of future supersonic airliners, equipped with these ultra-low NOx engine combustors, possibly would have relatively small effects on stratospheric ozone. "Protecting Earth's stratospheric ozone layer is our highest priority," said Louis Williams, director of the High-Speed Program. "So developing the technology to assure environmental compatibility for future supersonic airliners is the most important goal

of our program."

"The results of these initial ultra-low emissions combustor tests make us more confident we will achieve that goal," Williams added. The combustor sector that was evaluated was a "Lean Premixed Prevaporized" concept designed by GE Aircraft Engines. It mixes fuel and air upstream of the burning zone and allows enough time for the liquid fuel to vaporize completely before combustion.

The fuel-air mixture then enters

the combustion system and ignites downstream of a flame stabilizer where the speed of the mixture flow is somewhat slower. "The ultra-low levels of nitrogen oxide we've achieved in these tests are extremely encouraging. It shows that the ultra-low levels we previously saw in the laboratory can transition to combustor hardware," said Richard Niedzwiecki, chief of the Combustion Technology Branch, Propulsion Systems Division at Lewis Research Center.

NASA also is testing a "Rich Burn-Quick Quench-Lean Burn" concept developed by the Pratt Whitney Division of United Technologies. This design uses two combustion stages to reduce NOx production. First, excess fuel is put into a small amount of air. This "rich burn" environment causes chemical reactions that minimize NOx emissions. As the mix flows through the combustor, more air is added and combustion is completed in a final fuel-lean burning stage.



JSC Photo by Jack Jacob

From left, Stan Hutchison, Brian Boland, Brian Anderson, Tom Kwiatowski and Marv LeBlanc use a little elbow grease to spruce up the Mission Control Center mainframe computer complex. More than 35 members of the MCC team joined forces in some spring cleaning.

MCC team uses 'hands on' approach

By Eileen Hawley

The concept of "hands on management" took on new meaning for Control Systems Division management participating in a spring scrub-down of the Mission Control Center on Feb. 15.

Managers from Control Systems, Bendix, Rockwell and Unisys, rolled up their sleeves and "took ownership" of the facility, said division chief John Muratore. "The MCC is the primary American control center for human space flight," Muratore said, "and it should look high-tech and clean all the time."

No one in corporate memory recalled the last time the MCC received a real spring cleaning

Muratore said, and it was overdue. The regular cleaning contractor "does a great job," but had been specifically told not to clean the equipment to ensure no critical equipment was inadvertently turned off or on. Reduced MCC staffing levels meant that operators only had time to perform routine maintenance, not to clean the hardware.

Computers are very sensitive to dirt and grime, and even the smallest dust particle could cause serious problems. So Muratore, who assumed his role as division chief two months ago, decided to get the managers out on the floor to get some hands-on experience.

"It started out just with the management team," Muratore said. "But

as we worked, the operators on duty joined in and started to clean too. By the time we made it to the third floor, the folks up there had a lot of cleaning already done." Originally, the plan was to clean only the first floor main frame computer room, but work went smoothly with the support of the MCC operators, and all three floors now testify to the success of the spring cleaning expedition.

"Everyday we work really hard to make the control center better," said Muratore, "but sometimes the result isn't so visible. On this particular day, we could leave knowing that we had made the MCC better. This is what team work is all about."

Safety management is cost effective

(Continued from Page 1)

be used elsewhere. An effective safety management program helps cut costs substantially through prevention of lost-time injuries

Areas chosen for Packard's inspection were based on JSC or contractor lost-time injury rates. Those rates are determined by comparison rankings between other industries in the same standard industrial classification. Areas with lost-time rates above the norm were inspected first.

With approximately 70 percent of the inspections completed, the Test Operations and Institutional Safety Branch is accumulating data on a sample of the center population which will point to trends and help

determine safety strengths and weaknesses.

"We want to reemphasize the importance of making sure that our workplace complies with OSHA safety requirements," said Richard Holzapfel, branch chief. "The data we are acquiring indicates there may be some areas on site that may not meet those requirements, and we will respond to those situations."

Each inspection conducted by Packard has resulted in safety discrepancies being uncovered. In all cases the supervisors in charge of those areas are working closely with the safety organization to resolve the identified hazards.

Also, as the first federal agency to

seek entry into OSHA's Voluntary Protection Program, JSC's safety efforts serve as a model for other NASA centers and federal agencies.

JSC will officially kick off the pilot safety program in early 1995. In the meantime, these safety inspections will help to identify problem areas and provide insight into safety roles and responsibilities to line management.

The VPP emphasizes direct involvement by JSC employees and contractors to maintain a safe and productive workplace.

For additional information on the safety inspections or the Voluntary Participation Program, contact Packard at ext. 45378.

JSC's taxi service a victim of budgetary constraints

As a result of constrained budgets, JSC's on-call taxi service is being replaced with shuttle bus service effective Tuesday.

A shuttle bus schedule was printed on Page 4 of the Feb. 18 Roundup. Unfortunately this article, which should have accompanied the printed schedule, was omitted.

In addition, one error appeared on the printed schedule. The shuttle bus schedule for Route A shows Bldg. 261 as a destination. That should be corrected to read "Bldg. 260."

While the on-call taxi service will be discontinued, the Rockwell and Lockheed shuttle buses will continue operation both on-site and between their respective facilities.

"This will reduce our capability to support special events with buses and drivers," said Center Operations Director, Grady McCright. Organizations requiring transportation for large groups may not find the support previously available with the taxi service. According to McCright, special taxi service still will be available for handicapped employees.

Space News Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday by the Public Affairs Office for all space center employees.

Dates and Data submissions are due Wednesdays, eight working days before the desired date of publication.

Editor Kelly Humphries
Associate Editor Karl Fluegel
Associate Editor Eileen Hawley

Physical fitness race is under way

Health-Related Fitness Program officials are on a quest to help JSC win the 1994 NASA Fitness challenge.

The fitness challenge is an annual event that runs from March through August at all field centers. The winning center is determined by the percentage of the workforce qualifying for a Presidential Sports Award.

"In the past, JSC has not done well compared to other NASA centers," said Larry Wier, director of health-related services. "In fact, we got the beepers beaten out of us last year."

The problem, according to Wier, is that even though most JSC employees are exercising on a regular basis, they don't fill out the fitness logs used to determine center-wide participation. Other centers solve this dilemma by completing the logs for participants exercising at their facilities.

In order to compete on an even basis with the other centers, Wier said the fitness staff at the Gilruth Center will be maintaining the fitness

logs for participants in five different activities—sports/fitness, running, walking/jogging, basketball and volleyball.

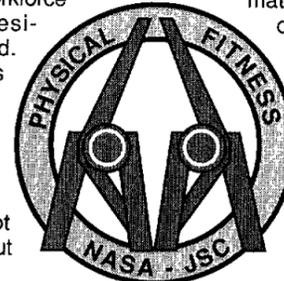
People participating in these five exercise categories should sign up for the fitness challenge at the Gilruth and then record their information on one of the large

charts posted in the exercise room or at the entrance to the new gym. "When the standard for an event has been reached," said Wier "a staff member will fill out the log, call the participant in for verification and signature and send the log to

Headquarters."

Individuals not participating in any of these five exercise categories may keep their own fitness logs for any of 62 different activities that qualify for the fitness challenge. Requirements for the events must be met within four months, any time during the six month challenge period.

For additional information on joining the fitness challenge, contact Wier at ext. 30301.



Mission studies applications for space station research

(Continued from Page 1)

ness, and the behavior of structures such as a miniature space station truss and joint in weightlessness.

"We're trying to learn what experiments make sense to do in this microgravity environment, how much power should they take, what kind of volume, what kind of crew interaction they require," Casper explained. "We're trying to answer those kinds of questions so that we can better operate and make better use of space station when we get there."

An on-time launch Thursday would have *Columbia* scheduled to land at 7 a.m. March 17 at KSC.

At pad B this week, technicians installed space suits in *Columbia's* airlock, to be used if an unplanned spacewalk were needed; closed out the engine compartment in preparation for launch; fueled the orbital propulsion systems; and performed final tests of the connections between the cargoes and *Columbia*.

Elsewhere at KSC, *Endeavour* is being readied for a launch in early April on its sixth flight, shuttle mission STS-59 with the Space Radar Laboratory-1, a radar system that will study Earth's geography, geology, environment and terrain from the cargo bay.

MCC open for viewing

The Mission Control Center viewing room will be open to JSC and contractor badged employees and their families during portions of the STS-62 mission.

Based on a Thursday launch, employees will be allowed to visit the MCC Friday from 11:30 a.m.-2:30 p.m. and 5-7 p.m. and on Sunday from 1-5 p.m.

The MCC also will be open from 11:30 a.m.-2:30 p.m. on March 9, from 1-5 p.m. March 12; 11:30 a.m.-2:30 p.m. March 14; and on March 16 from 11:30 a.m.-2:30 p.m. and from 5-7 p.m.

There will be no scheduled viewing hours on March 17 due to the planned landing.

Employees must wear their badges and escort family members through the regular public entrance on the northeast side of Bldg. 30. Children under 5 will not be permitted. No flash photography or loud talking will be permitted at any time.

Because of the dynamic nature of shuttle missions, viewing hours may be changed or canceled without notice. For the latest information on the schedule, call the Employee Information Service at x36765.

Credit union sets annual meeting

The JSC Federal Credit Union will hold its annual meeting at 7 p.m. March 3 in the lobby of its main office location.

Three directors will be elected during voting to be conducted from 9 a.m.-5 p.m. at each credit union office, and again from 6:30-7 p.m. at the main office lobby. The nominating committee has placed the follow-

ing names on the candidate list: Peter J. Cerna, Lloyd G. English, Stanford J. LeBlanc, Terry K. Lindsey, Alex Monchak, David C. Schurr, David W. Whittle and Peggy A. Zahler.

Eligible voters include credit union members who are primary account holders and who are 16 years old or older.